The Global Aviation Information Network (GAIN): Using Information Proactively to Improve Aviation Safety

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Abstract

The Federal Aviation Administration (FAA) proposed the Global Aviation Information Network (GAIN) as a voluntary, privately owned and operated network of systems that collect and use aviation safety information about flight operations, air traffic control operations, and maintenance to improve aviation safety worldwide.

The necessity for better ways to improve safety is revealed by the worldwide aviation accident rate -- after enjoying a decline to a commendably low rate, it has been stubbornly constant for the last 10-15 years, and the aviation community must determine how to get off this "plateau." The desirability of using information more effectively to get off the plateau has been demonstrated by the successes over the years of the airlines that have been doing it, as well as the testimony that is so common in accident hearings, that "we all knew about that problem" -- revealing that problems were known but not acted upon. The capability to use information proactively to improve safety has been enhanced by technological advances that facilitate more effective collection and use of information about adverse trends. Experience has demonstrated that the systematic collection and sharing of aviation safety information can (a) facilitate the correction of troublesome trends before they cause accidents, and (b) result in significant immediate cost savings in operations and maintenance.

Because all accidents ultimately trace to human error somewhere in the accident chain, and because human error cannot be eliminated, the challenge in being proactive with information is how to use that information to make the aviation system *less error prone* and *more error tolerant*. This involves a major paradigm expansion, namely, moving beyond focusing primarily upon the operator -- *e.g.*, with regulation, training, and punishment -- toward focusing more upon improving the system in which the operator is operating. This does not *reduce* the operator's safety accountability; to the contrary, it *increases* the safety accountability of all the others who design, build, and maintain the system.

Other transportation modes are also developing information collection and sharing programs in an effort to use information proactively. Outside of transportation, the Critical Infrastructure Assurance Office (CIAO) was created in response to Presidential Decision Directive 63, which expressed concern in 1998

about the vulnerability of America's information infrastructures to hackers and terrorists, and CIAO is now developing ways to collect information about near breaches of infrastructure security in an effort to prevent actual breaches. Also, the Institute of Medicine issued a report in 1999 estimating that as many as 90,000 people die each year from medical errors, and it proposed the establishment of processes to collect and use information proactively help prevent such errors.

Experience is showing that processes for using information proactively to help avoid undesired outcomes can be very generic and broadly applicable to these and other industries. Accordingly, the GAIN program is working with these industries to exploit the many opportunities for sharing scarce resources to develop these generic processes. In addition, the GAIN program is exploring ways in which these processes can be applied to improve aviation security.

Extensive information about GAIN is on the Internet at http://www.gainweb.org.

A. The Accident Rate Plateau

After declining significantly for about 30 years to a commendably low rate, the worldwide commercial aviation fatality accident rate has been stubbornly constant since 1980-85. Given the projected increase in volume in international aviation traffic, studies by Boeing forecast that unless the aviation community resumes its decline from this accident rate
"plateau," there will be a major hull loss every seven to ten days, somewhere in the world, by the year 2015. The FAA proposed GAIN because that is an unacceptable result.

The question is how to get *off* the accident rate plateau. Many activities around the world are directed at improving aviation safety. New technologies, such as enhanced ground proximity warning systems, more sophisticated collision avoidance systems, satellite navigation to improve navigation accuracy everywhere in the world and eliminate non-precision approaches, and many more, are improving safety. Aviation regulatory agencies have all played a major role in their regulatory, inspection, and enforcement responsibilities. Significantly improved training for pilots, mechanics, flight attendants, air traffic controllers, dispatchers, manufacturer personnel, and other aviation professionals has also contributed to improved safety.

All of these activities, and more, are crucial, and they have all contributed to the dramatic reduction of the worldwide aviation accident rate since 1950. Moreover, increasing international collaboration will help to insure that these activities will continue and expand, as they must. The leveling of the accident rate curve, however, suggests that the marginal safety benefits from these previous ways of improving safety are diminishing, and that additional means of preventing accidents and incidents are needed.

One of the "new" ways that many in the world aviation community are now exploring is the collection and sharing of information about aviation safety problems before those problems result in accidents or incidents. All too often, the testimony at accident hearings from the "hands-on" people on the "front lines" is that, "We all knew about that problem." The challenge is to get the information that "we all knew about" – not only from pilots, but also from flight attendants, air traffic controllers, mechanics, dispatchers, manufacturers, designers, airport operators, the workers on the ramp who close the cargo door, and others – and do something about it *before* it results in accidents or incidents.

B. The Heinrich Pyramid

Not hearing about problems that "we all knew about" is a common characteristic of potentially hazardous endeavors of all kinds, as depicted by the Heinrich Pyramid (Figure 1). The Heinrich Pyramid shows that for every fatal accident, there will be 3-5 non-fatal accidents, and 10-15 incidents, but there will be *hundreds* of unreported occurrences (the exact ratios vary with the nature of the endeavor).

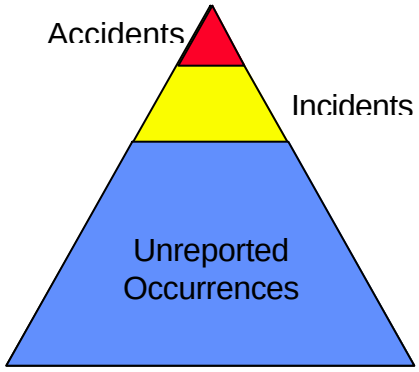

Figure 1: The Heinrich Pyramid

Usually these occurrences are not reported because, by themselves, they are innocuous, *i.e.*, they did not result in an accident or incident. Because of the robustness of the backups, redundancies, and safeguards in the aviation system, rarely does any single problem result in harm or damage. Today's unreported occurrences, however, are the "building blocks" of tomorrow's accidents and incidents; and when they happen in conjunction with other building blocks from the "unreported occurrences" part of the pyramid, they may someday become an accident or incident.

There are many aviation examples of the Heinrich Pyramid concept, but two accidents, one relatively old and the other more recent, demonstrate that the problem is just as real today as it ever was. One accident occurred in 1974, west

of Dulles International Airport, near Washington, D.C. The pilots were apparently confused by the written instructions (known as the "approach chart") for a non-precision approach, in conjunction with what the air traffic controllers said, about when to descend. They descended too soon and hit a ridge.

At the accident hearing it was revealed that other pilots had previously experienced the same confusion on that approach, but the ridge was not in the clouds during those previous approaches. When the accident occurred, however, the ridge was obscured by the clouds. One of the most tragic aspects of this accident is that pilots from one airline had reported the problem to their management – which in itself was unusual in those days – and management distributed warnings to their pilots, but the crash involved a different airline.

The other accident occurred in Strasbourg, France, in 1992. One possible cause of the accident was that the pilots thought they had directed their autopilot to make a 3.2-degree descent in a non-precision night approach in mountainous terrain, but they erroneously directed it to make a descent of 3200 feet per minute. Although the mode distinction between angle of descent and rate of descent was apparent elsewhere in the cockpit, the window into which they dialed the number would have said "3.2" for a 3.2-degree angle of descent, but instead it said "32" – without the period – which meant a 3200 fpm descent. Once again, the pilots "all knew about" the potential problem.

Several significant lessons are apparent from these two accidents. First, they are textbook examples of problems that the hands-on personnel knew about, but that nonetheless resulted in an accident before the problems were corrected.

Second, all of the links in the chains that led to both accidents were in the "unreported occurrences" part of the pyramid. The approach chart confusion and the autopilot mode error, by themselves, were innocuous, and thus unlikely to be reported in most reporting systems in place today -- whether voluntary or mandatory – until they resulted in an accident or incident.

Third, the approach chart confusion and the mode error, by themselves, are not only not accidents or incidents, they are normally not even potential regulatory violations. Most commercial aviation systems usually learn about nearly all accidents and most incidents. Some reporting programs also mandate the reporting of potential regulatory violations, and other programs, such as the Aviation Safety Reporting System (ASRS), funded by the FAA and operated by NASA, provide incentives for the voluntary reporting of potential regulatory violations. However, there is no reasonable way to mandate the reporting of occurrences that do not rise to the level of accidents, incidents, or potential regulatory violations. Instead, short of an accident or incident, the system will generally have to rely upon *voluntary* reporting to learn about these types of problems.

Last, but not least, these accidents illustrate the importance of *international* information sharing, because (a) operators from all over the world fly into Dulles; and (b) the autopilot in the Strasbourg airplane was in airliners all over the world, and the accident could have occurred anywhere in the world.

These accidents also raise a question that is fundamental in most aviation accidents and incidents: why do aviation professionals who are highly trained, very competent, and proud of doing the right thing and doing it well, still make inadvertent and potentially life-threatening mistakes that can hurt people, including themselves? Blaming the problems on "human error," even if accurate, does little to prevent recurrences of the problem. Stated another way, if people are tripping over a step "x" times out of a thousand, how big must "x" be before we stop blaming the person for tripping, and start focusing more attention on the step, *e.g.*, should it be painted, lighted, or ramped?

The flattening of the accident rate curve suggests that our historic focus on the individual, while necessary, is no longer sufficient. Instead of focusing primarily upon the *operator*, *e.g.*, with more regulation, punishment, or training, it is time also to focus more attention on the *system* in which the operators are operating. Given that human error cannot be eliminated, the challenge of this increased focus is how to make the system (a) less likely to create conditions that could result in human error, and (b) more capable of withstanding such errors without catastrophic result.

This expansion -- from focusing primarily upon the operator, to also improving the system to be less error prone and more error tolerant -- will constitute a major expansion beyond how the aviation community has usually responded to human error. However, it does not mean *reducing* the safety accountability of the operators in the system. To the contrary, it means *increasing* the safety accountability of the people who design, build, and maintain the system.

Commercial aviation accidents are, fortunately, such rare and random events that they are analogous to light coming out of a box without any discernible pattern – making it very difficult to determine why the light comes out when it does. Upon opening the box, we discover that it contains a series of disks with holes, spinning about a common axis. The light emerges from the box – an accident occurs – if and only if the holes line up (Figure 2). This borrows from the Swiss cheese analogy developed by Prof. James Reason from Manchester University in the UK – when the holes in a stack of cheese slices line up, that represents an accident.

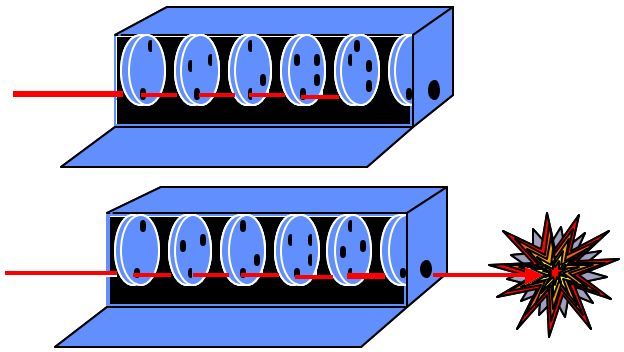

Figure 2: The Spinning Wheels

Each spinning disk (or slice of cheese) could be compared to a link in the chain of events leading to an accident. Each disk constitutes a defense against an accident or other undesired result, and the holes in the disks represent weaknesses in the defense. One disk might be the confusing approach chart, another might be the autopilot mode confusion, another might be a confusing page in a maintenance manual, and still another might represent management's attitude toward safety. A study by Boeing reveals accident chains with as many as twenty links, and each one is an event that, with a different outcome, would have broken the chain and avoided an accident. Each link, individually, is usually innocuous and in the "unreported occurrences" part of the pyramid, but when they happen to combine in just the wrong way – when the holes in the spinning wheels happen to line up – that is an accident.

Viewed in that manner, the challenge in collecting and sharing information to prevent accidents is to obtain information about each spinning wheel, each link in the chain, separately, to try to determine how to reduce the number of holes in each wheel. This effectively dissects a potential accident or incident into its component parts in order to facilitate a
separate remedy for each part.

C. The GAIN Concept

In order to accomplish this information collection and sharing to learn about the potential individual links in an accident chain, the FAA proposed GAIN, the Global Aviation Information Network. With a voluntary privately owned and operated global *network* of data collection and exchange systems – thus the inclusion of "Network" in the name – government, industry, and labor can cooperate with each other, to their mutual benefit, to make the system safer (Figure 3).

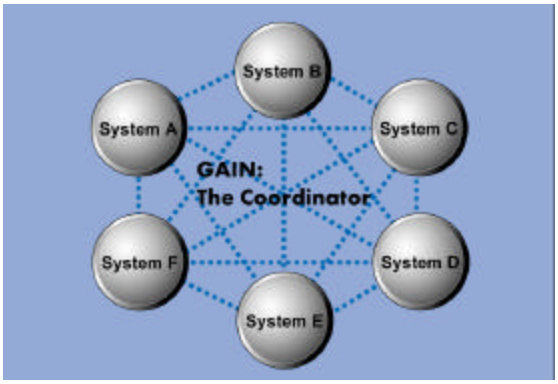

Figure 3: GAIN as a Network of Systems

1. The Importance Of Private Ownership. Experience has shown that proactive use of information not only has the potential to improve safety, but can also result in significant immediate cost savings in operations and maintenance. If this proactive information concept reduces costs and helps to improve safety, then the aviation community will *want* to own it, and the savings will create a strong incentive to operate more safely. Thus, private ownership would operate GAIN far more efficiently and effectively than a government agency because – without criticizing any government agency – private industry has both (a) greater ability to respond quickly and precisely to issues that arise, and (b) more direct economic incentive to do so.

2. Potential Information Sources. Information could be collected from a variety of aviation community professionals – pilots, mechanics, flight attendants, air traffic controllers, ramp personnel, dispatchers, airport operators, the military, manufacturers, government regulators, and others. Then, instead of discarding the vast majority of the information, as we do today, we would analyze it to determine norms, discern problems, and otherwise "mine" the information for the valuable "gold" it contains.

Many of these potential information sources are obvious, but others are not. The business aviation community, for example, is a valuable source of information. Before an airline buys several hundred of a new high technology autopilot, for example, several Fortune 500 companies probably used it already in their fleets. Thus, operations by the Fortune 500 fleet provide an actual-use experience base for many advanced technologies that is not obtainable any other way; and this provides valuable information about many operational human factors problems that may only be discernible from actual use. For this reason, the GAIN Steering Committee is fortunate to include the National Business Aviation Association, the membership of which includes many Fortune 500 companies.

3. The Need For More Powerful Analytical Tools. Rapidly improving technologies are facilitating the collection of larger quantities of data. However, collection of data, by itself, accomplishes little to improve safety. Instead, the more information is collected, the greater the need for powerful analytical tools that will help transform large quantities of input into usable amounts of life-saving knowledge. The improved safety and savings that can result will provide a powerful incentive to encourage the development and use of these analytical tools.

D. Other Information Collection and Analysis Activities

The FAA did not originate the concept of using aviation safety information proactively. To the contrary, many activities of this type were underway in other countries long before the FAA proposed GAIN. Instead, by proposing GAIN, the FAA is attempting to be a facilitator to help bring the numerous information collecting, analyzing, and sharing activities around the world into a more unified and systematic international network.

Among the world leaders in this endeavor are the United Kingdom CAA and some UK airlines, where flight data recorders have been routinely accessed as a source of valuable information for several decades. Thus, it is significant that the UK CAA joined the FAA to ask the Royal Aeronautical Society to host the second GAIN conference in London in May 1997. Similarly, British Airways developed the British Airways Safety Information System, or BASIS, and hundreds of airlines and other aviation entities all over the world are now using it.

In addition, in 1996, the French Academie Nationale de L'Air et de L'Espace published a document entitled "Feedback From Experience in Civil Transport Aviation" that recommended a proposal to collect, analyze, and disseminate aviation safety information, which GAIN closely resembles. Some of the Scandinavian countries have been reading flight data recorders routinely for many years; Japan Air Lines has had a proactive flight monitoring information program for several years; and proactive aviation safety information activities have been pursued in the former Soviet Union.

The same concept of using information proactively to prevent undesired outcomes is now being developed in industries other than aviation. Other transportation modes – maritime, highways, railroads, and pipelines – are in various states of developing such systems. Outside of transportation, the concept has already appeared in two major arenas – health care, and information infrastructure security.

In health care, the Committee on Quality of Heath Care in America, which was created by the U.S. Institute of Medicine, issued a report in 1999 entitled "To Err is Human: Building a Safer Health System." It reflects the concern that as many as 90,000 people a year die from medical mistakes, and proposes a system that is

very much like GAIN to systematically collect and analyze information about near-miss mistakes in order to learn more about how to prevent such mistakes. Much like GAIN, the premise of the system is described as follows:

> Preventing errors means designing the health care system at all levels to make it safer. Building safety into processes of care is a much more effective way to reduce errors than blaming individuals . . . . The focus must shift from blaming individuals for past errors to a focus on preventing future errors by designing safety into the system. . . . [W]hen an error occurs, blaming an individual does little to make the system safer and prevent someone else from committing the same error. (Id., p. 4).

The intense public interest in improving health care systems presents major opportunities for efforts to create the same generic processes for application in to aviation safety.

Similarly, Presidential Decision Directive (PDD) 63, issued in 1998, expressed concern about the vulnerability of the nation's information infrastructures to computer "hackers" and terrorists. Accordingly, the Critical Infrastructure Assurance Office (CIAO) was created to develop means of improving the security of such infrastructures. In order to learn more about the weaknesses of the various information infrastructures and how to remedy them, the CIAO plans to develop a system to collect information about near-breaches of information security – exactly the same process that GAIN and the medical community are developing.

By working together, the health care community, the information infrastructure community, the aviation community, and others, can avoid "reinventing the same wheel," to the mutual benefit of all concerned. FAA's GAIN support staff is actively exploring the opportunities with these and other industries.

E. Concerns About Information Misuse

One of the major problems with systematically collecting and analyzing large quantities of information is that information can be a very powerful tool; and like any powerful tool, it can be used properly with great benefit, or it can be used improperly and cause considerable harm. Following is a discussion of four major potential misuses of aviation safety information and remedies for each.

1. Punishment/Enforcement. First, potential information providers may be concerned that company management and/or regulatory authorities might use the information for punitive or enforcement purposes. Thus, a mechanic might be reluctant to report about a confusing maintenance manual that led to an improper installation, fearing that management or the government might disagree about the maintenance manual being confusing, and then punish the mechanic.

Such punishment causes two problems. First, the confusing maintenance manual will still be in use in the system, potentially confusing other mechanics. Second, and far worse, is that such punishment, in effect, "shoots the messenger." By shooting a messenger, management or the government *effectively guarantees that they will never again hear from any other messengers*. This, in turn, guarantees that those problems in the "unreported occurrences" part of the pyramid will remain unreported – until, of course, they cause an accident or incident, whereupon the testimony at the accident hearing, once again, will be that, "We all knew about that problem."

One aviation regulator, the UK CAA, announced years ago that, absent egregious behavior, *e.g*., intentional or criminal wrongdoing, they would not shoot the messenger, and encouraged their airlines and other aviation industry employers to take the same approach. That is a major reason why the UK has some of the world's leading aviation safety information sharing programs, both government and private. The type of facilitating environment created by the UK is essential for the development of effective aviation safety information collection and sharing programs.

Similarly, British Airways gave assurances that they would also not shoot the messenger in order to get information from pilots, mechanics, and others for BASIS. Many other airlines around the world are concluding that they must do the same in order to obtain information they need to be proactive about safety.

Significant progress has also been made on this issue in the U.S. In October 2001, the FAA promulgated a regulation, modeled after the UK example, to the effect that information collected by airlines in FAA-approved flight data recorder information programs (commonly known as Flight Operations Quality Assurance (FOQA) programs) will not be used against the airlines or their pilots for enforcement purposes, 66 F.R. 55042 (Oct 31, 2001). FOQA programs complement Aviation Safety Action Programs (ASAP), announced in January 2001 by President Clinton, in which airlines collect reports from pilots, mechanics, dispatchers, and others about potential safety concerns.

2. Public Access. Another problem in some countries is public access, including media access, to information that is held by government agencies. This problem does not affect the ability of the aviation community to create GAIN-type programs, but it could affect the extent to which government agencies in some countries will be granted access to any information from GAIN. Thus, in 1996 the FAA obtained legislation, Pub.L.104-264, 49 U.S.C Section 40123, that requires it to protect voluntarily supplied aviation safety information from public disclosure.

This will not deprive the public of any information to which it would otherwise have access, because the agency would not otherwise receive the information; but

on the other hand, there is a significant public benefit for the FAA to have the information because the FAA can use it to help prevent accidents and incidents.

3. Criminal Sanctions. A major obstacle to the collection and sharing of aviation safety information in some countries is the concern about criminal prosecution for regulatory infractions. Very few countries prohibit criminal prosecutions for aviation safety regulatory infractions. "Criminalization" of accidents has not yet become a major problem in the U.S., but the trend from some recent accidents suggests the need for the aviation community to pay close attention and be ready to respond.

4. Civil Litigation. One of the most significant problems in the U.S. is the concern that collected information may be used against the source in civil accident litigation. Significantly, the thinking on this issue has changed dramatically in recent years because the potential benefits of proactive information programs are increasing more rapidly than the risks of such programs. Until very recently, the concern was that collecting information could cause greater exposure to liability. The success stories from the first airlines to collect and use information, however, have caused an evolution toward a concern that *not* collecting information could result in increased exposure.

This evolution has occurred despite the risk that the confidentiality of information collection programs does not necessarily prevent discovery of the information in accident litigation. Two cases in the U.S. have addressed the confidentiality question in the context of aviation accidents, and they reached opposite results. In one case, the judge recognized that the confidential information program would be undermined if the litigating parties were given access to the otherwise confidential information. Thus, he decided, preliminarily, that it was more important for the airline to have a confidential information program than it was for the litigating parties to have access to it. In re Air Crash Near Cali, Colombia, 959 F.Supp. 1529 (S.D.Fla. 1997). In the other case, the judge reached the opposite result and allowed the litigating parties access to the information. In re Air Crash at Charlotte, 982 F.Supp. 1052 (D.S.C. 1995).

As this issue is decided in future cases, in aviation and other contexts, hopefully the courts will favor exempting such programs from the usual -- and normally desirable -- broad scope of litigation discovery. However, present case law is inconsistent, and future case law may not adequately protect the confidentiality of such programs. Thus, given the possibility of discovery in accident litigation, aviation community members will have to include, in their decision whether to establish proactive information programs, a weighing of potential program benefits against the risks of litigation discovery.

On the benefits side, the effectiveness of information collection programs was studied by an insurance company that compared worldwide aviation accident rates against accident rates for airlines that routinely use flight data recorder (FDR)

information. The data revealed that airlines with programs that were more than 14 years old had a *six times lower* accident rate than the world average, and also considerably lower than the U.S. rate (Figure 4). This disparity will probably increase as information collection and analysis programs mature and become more effective at improving safety.

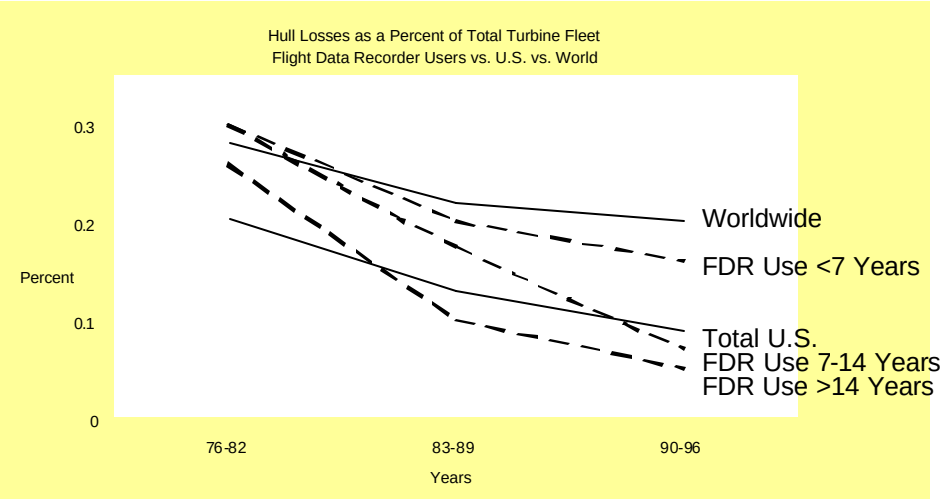

Figure 4: Effectiveness of FDR Use

As these programs improve and are implemented by more airlines, they will begin to define "good industry practice" that will serve as a baseline for the purposes of tort liability. Thus, the aviation community is evolving to a concern about *not* collecting information because not collecting information will increasingly represent a departure from good industry practice, which in turn will create the possibility of increased liability exposure.

It has been suggested that, given the FAA's success at obtaining legislative protection in relation to the public disclosure issue, the FAA should also seek legislation to protect aviation safety information from discovery in litigation. Unlike with respect to public disclosure, however, the chances are not good that Congress would enact such legislation. Moreover, a failed attempt to obtain such legislation could exacerbate the problem because this discovery issue is resolved case by case. Thus, for example, in the Cali case noted above, in which the judge granted protection for the confidential information program, the outcome might have been different if Congress had previously been asked to give such protection but declined to do so, because the judge might have been reluctant to give protection that Congress would not.

5. The International Situation. Because these potential misuses of aviation safety information can occur in varying degrees in many other countries, the FAA has asked ICAO, the International Civil Aviation Organization (the aviation arm of the United Nations), to urge its nearly 190 member countries to review their legal and regulatory structures and make modifications as needed, as the U.S. has done. As a result, in 1998, ICAO passed a resolution urging its members to improve

safety through enhanced collection, analysis, and dissemination of safety information.

Moreover, in 1999, the ICAO Accident Investigation Group recommended revising Annex 13, relating to accident investigation, to require its members to establish non-punitive incident reporting systems, promote the establishment of information sharing networks, and facilitate the free exchange of information about potential safety deficiencies. These ICAO actions are a major step toward creating a worldwide environment in which GAIN-type programs can flourish and be effective.

F. Next Steps: The Need for Widespread Participation

In 1996, the FAA published a concept paper to solicit public comment about GAIN. Since then, there have been five GAIN conferences, each moving the concept further toward implementation. For example, at the request of attendees at the third GAIN conference, a GAIN Working Group developed an "Operator's Flight Safety Handbook" to show airlines how to develop safety information programs. This handbook was given to attendees at the fourth GAIN conference and has since been distributed by the thousands throughout the world. An update of the Handbook, along with other products developed by the Working Groups, was distributed at the fifth GAIN conference.

Consistent with the FAA's original proposal that GAIN be privately owned and operated, the aviation community is stepping up to the challenge. Unlike the first two conferences, the last three conferences were sponsored by private entities – Airbus Industrie, Delta Airlines, Air France and United Airlines. Moreover, the GAIN Steering Committee is led by industry and includes airlines, manufacturers, the military, unions representing pilots, air traffic controllers, and mechanics, general aviation, and the Flight Safety Foundation -- and notably, the FAA is only an *ex-officio* member. Last but not least, the four Working Groups -- Aviation Operator Safety Practices, Analytical Methods and Tools, Global Information Sharing Prototypes, and Government Support Team -- are where most of the hands-on work of GAIN takes place, and most of the members of the Working Groups, other than the Government Support Team, are from private industry.

Nonetheless, just as aviation safety improvements require cooperation and participation from all elements of the aviation community, the next steps for GAIN involve efforts by all elements of the community. Industry, governments, and labor must work together to encourage the establishment of more programs to collect and analyze information. Industry, governments, and labor must also work together to encourage more systematic sharing of the information. Governments must help facilitate collection and sharing by assuring that their laws, regulations, and policies do not discourage such activities, and by funding research to develop improved analytical tools for using large quantities of information more effectively. In countries where governments operate air traffic control systems,

governments must also take the necessary steps to begin information collection and analysis programs within their ATC systems.

The incentive for such widespread participation is that *everyone* wins. Private industry wins in the long run because of improved safety, and in the short run because of significant immediate cost savings in operations and maintenance. Labor wins because, instead of being the brunt of blame and punishment, labor becomes a valuable source of information about potential problems and proposed solutions to accomplish what everyone wants – improved safety and reduced costs. Government regulators win because the more they understand what is not working and why, the smarter they can be about proposing remedies, which makes the remedies both more effective and more credible. In turn, this further benefits industry and labor because improved effectiveness of remedies means greater cost effectiveness on implementing the remedies. Last but not least, the public wins because transportation becomes safer and less costly.

G. GAIN for Security?

Although the means for preventing intentional wrongdoing are significantly different in many respects from the means for preventing inadvertent error, the concept of using information proactively to prevent undesired outcomes also has applicability in preventing intentional wrongdoing. As the need for greater aviation security has become more apparent after the September 11, 2001, terrorist attacks in the U.S., the GAIN staff is exploring ways in which its processes, designed to improve safety, can also help buttress security.

Conclusion

GAIN is the voluntary sharing of safety information within and among networks of users in the international aviation community to improve aviation safety.

There are many programs around the world that are already using aviation safety information proactively to improve safety. Recognizing that no single element of the aviation community can improve safety by itself, all facets of the aviation community are working together in this endeavor – airlines, manufacturers, pilots, mechanics, flight attendants, dispatchers, regulatory authorities, the military, academia, suppliers, the insurance industry, and others.

The opportunity exists as never before to bring these programs together, to their mutual benefit, into an international network to collect and share information to improve worldwide aviation safety, and GAIN is helping that concept to become a reality. As FAA Administrator Jane Garvey noted in her remarks at the third GAIN conference in Long Beach, California, in November, 1998, "GAIN is one of our best hopes for enhancing aviation safety in the next century."

http://www.asy.faa.gov/gain